

REMARKS

Claims 1-57 and 59 are now pending in the application. Claim 59 has been added to the present application. The Examiner is respectfully requested to reconsider and withdraw the rejection(s) in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 102

Claims 1-4, 7-17, 19-21, 25, 27-31, 34-44, 46-49, 53 and 56-57 stand rejected under 35 U.S.C. §102 as being anticipated by U.S. Patent No. 5,845,266 (Lupien). This rejection is respectfully traversed.

A test case demonstrating the fundamental difference between Lupien and the present invention can be constructed by imaging a specific market scenario to which the invention applies. We imagine a market in which there are three assets A, B, C being traded, and we imagine that the orderbook presented to the apparatus of the invention involves three traders submitting limit orders as follows:

Order 1: Trader 1 orders 100 units of asset B in exchange for 100 units of asset A.

Order 2: Trader 2 orders 100 units of asset C in exchange for 100 units of asset B.

Order 3: Trader 3 orders 100 units of asset A in exchange for 100 units of asset C.

According to Claim 1 of the invention, matching coefficients are defined, one for each order being processed by the house. Thus, in our example, three matching coefficients are defined, corresponding to the three orders assumed. The values assigned to these coefficients during the operation of this embodiment are each numbers between 0 and 1. We denote these three matching coefficients as Alpha1, Alpha2 and Alpha3.

Under this example embodying the invention, the three matching coefficients, alpha1, alpha2, alpha3 one per order, signify the fractions (between 0 and 1) of the three orders which are to be optimized according to claim 1 of the invention.

Applicant's invention envisages a choice of target function as a criterion. One target function, which can be chosen according to an embodiment of the invention, would be the volume of the three orders, being a function of the matching coefficients \times value of the order, referenced to an exchange rate and evaluated by reference to one asset, let us choose the asset A, with all exchange rates here being assumed to be equal to 1. The target function, of Alpha1, Alpha2, Alpha 3, in this case would then be:

$$(*) 100 \times \text{Alpha1} + 100 \times \text{Alpha2} + 100 \times \text{Alpha3}.$$

(**) The constraints, according to this exemplary embodiment of the invention, would in this case represent the condition that the house, taking the negative position to that of the traders, would be:

1. Condition for each asset being held by the house after the set of trades have been executed:

$$\text{For asset A: } 100 \times \text{Alpha1} - 100 \times \text{Alpha3} \geq 0.$$

$$\text{For asset B: } -100 \times \text{Alpha1} + 100 \times \text{Alpha2} \geq 0.$$

$$\text{For asset C: } -100 \times \text{Alpha2} + 100 \times \text{Alpha3} \geq 0.$$

It is easy to see by direct inspection, in this example that, the optimized coefficients, subject to the defined constraints will be:

$$\text{Alpha1}=1$$

$$\text{Alpha2}=1$$

$$\text{Alpha3}=1$$

This set of matching coefficients clearly optimize the value of the target function (*) and also satisfy the constraints (**) subject to the further condition, that the three matching coefficients be between 0 and 1.

In commercial context, this reflects the fact that the house applying this embodiment of the invention in its trading relations with its traders is fully hedged after doing the three transactions, and that it has maximized the total volume of the three transactions. Of course, this is purely an example of the operation of the invention. Different constraints and criteria may be used, within the scope of claim 1.

Lupien's invention teaches nothing explicitly how the invention is to be applied to a situation in which more than two assets are traded. As will be analyzed in the next section, Lupien explicitly assumes that the apparatus will be applied to a market in which all participants express an interest in exchanging one fixed asset A against another asset B, and all constructions taught in Lupien explicitly assume that the traders can be divided into two groups, the buyers of the fixed asset B, paying at a specified price, in terms of A, and the sellers of B, paying at a specified price, in terms of B, and receiving the appropriate amount of A, according to the specified price.

In order to apply Lupien, it is evidently necessary to break up the market into separate markets, according to two assets per market, so that the prescriptions of the invention can then be applied.

In the example given, there are three assets and three distinct pairs of assets involved in the order batch being considered, and hence in order to apply Lupien we need to consider three distinct markets each of which is capable of being cast into Lupien's two-asset (price, amount) grid framework:

A market for asset pair $\{A,B\}$.
A market for asset pair $\{A,C\}$.
A market for asset pair $\{B,C\}$.

For each of these three markets, in order to apply Lupien, one has to select the subset of orders which involve only that pair.

This leaves one with assigning Order1 to the $\{A,B\}$ market, Order2 to the $\{B,C\}$ market and Order3 to the $\{A,C\}$ market.

It is therefore clear that each submarket to which one might wish to apply Lupien consists of only one single order, in each case only a buyer of one asset for another asset, without a corresponding seller.

Supposing that each trader had defined and submitted to the market an "order" which, according to Lupien, is in fact an alternative set of orders, defined by assigning subjective satisfaction values to each of a set of pairs {amount, price} according to a 2-dimensional grid or matrix, the operator of Lupien would be unable to compute a mutual satisfaction density matrix, since the Lupien construction assumes there to be at least one buyer and one seller for the operation of the apparatus to be possible.

In summary, the example above, which, while simple, makes apparent the characteristic situation to which the invention applies, and the nature of the invention in dealing with it, illustrates the difference in the operation of the two inventions and the different definition, mathematical characteristics, process of assignment and operational role of the matching coefficients in the two cases.

According to Lupien, the starting point of the operation of the system is a set of satisfaction density profiles, one for each trader submitting orders. This is defined in Lupien as follows:

“The satisfaction density profile characterizes the trader’s range of interest in the transaction at each (price, size) combination. The trader can enter at each grid point on the satisfaction density profile a satisfaction density value, indicating the trader’s willingness to trade that size order at that price.”

Assuming, to fix ideas, that the three traders each had expressed their preferences in relation to the potential exchange between the two assets in which they were interested in trading, through a satisfaction profile in a grid containing 10 different sizes and 10 different prices, there would be 100 “coefficients” involved in the satisfaction density profile, one for each trader. In all, in our example, 300 coefficients would be involved to specify the orders in Lupien. The minimal case in which Lupien construction would apply in non-trivial ways would be a grid of size 2, implying that, for each trader to specify two sizes and two prices, making for 4 coefficients per trader or 12 coefficients involved in specifying satisfaction density profiles for this example. This contrasts with the three matching coefficients involved in the same scenario with the present invention.

More importantly, as is clear in this example, the coefficients of the satisfaction density profile are subjective values assigned by traders to potential transactions, whereas the matching coefficients, in the words of claim 1 of the invention, represent the proportion of a particular order that is to be satisfied, which is the result of the operation of the apparatus and quite independent of the subjective value attached to a trade by each trader.

Furthermore, it is seen from this example, that the coefficients in the *mutual satisfaction function* also defined in Lupien, which represent the decision of the system

as to which trades should be executed, in this simple case would not be defined since the Lupien construction could not find a “counterparty”, i.e. a seller for a buyer for a seller that had submitted their satisfaction density profile.

The example provided for illustration is not in any way contrived or special but illustrates the absolutely fundamental difference of purpose, construction and technical operation of the present invention in relation to Lupien.

In the example provided above, we have noted that the procedure in Lupien can not succeed in the computation of a mutual satisfaction function unless there are more than one satisfaction density profiles in any on 2-asset market. This is a major technical difference between the present invention, where matching coefficients are always defined, and can often be assigned values greater than 0, reflecting successful enabling of trades and Lupien which can only be applied at all if there is at least one buy order and one sell order, relating to one and the same pair of assets. Note that in claim 1, the “particular first resource ordered by a particular user” does not have to be the same resource ordered or offered by all users (see the example of the three orders described above.)

We note further that the Lupien “optimality” concerns a computed quantity which in itself is based on entirely subjective assignments of “satisfaction” which are not objectively observable. The optimality in the present invention can be precisely defined in terms of numerical measurables only, e.g. an exchange rate and a volume.

The example also shows that the matching coefficients which play the crucial role in the invention are not those occurring in Lupien, as schematically laid out in the table above.

The purpose of the Lupien method is to process certain novel types of “orders in a market in which participants wish to trade in two assets, which are fixed for the purposes of the workings of the invention. These “orders” are assumed to be formulated not as is customary, as requests to exchange one specific quantity of A for a fixed quantity of B but are formulated through “satisfaction profiles” which assign a subjective numerical measure of “satisfaction” to each potential pair {quantity, price}. Lupien is about how to “optimize” (in a suitable sense) the mutual satisfaction given the satisfaction profiles of each market participant who has so expressed their “order”.

There is no explicit discussion of how the Lupien invention might apply to a market in which participants are trading more than two assets. The technical steps, and claims, always refer to the case where there are only two assets, and hence a potential user of the invention dealing with multiple assets can only split a market with more than two assets into sub-markets, each of which defined by a pair of assets.

In sum, the present invention is wholly distinct from Lupien in several respects: it is designed for markets in which more than two assets are traded; it creates solutions where any apparatus operating only on two assets must fail, including the Lupien apparatus; it does not require or assume that users in a market express their orders in the form of satisfaction profiles; and it does not deal with any form of alternative orders, such as those described in Lupien. Therefore, we feel that the pending claims define patentable subject matter over the cited reference. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

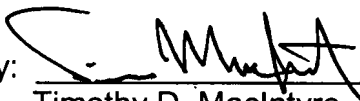
CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested.

If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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